

THE MALE GENITALIA OF BLATTARIA. VII.
GALIBLATTA, *DRYADOBLATTA*, *POROBLATTA*,
COLAPTEROBLATTA, *NAUCLIDAS*, *NOTOLAMPRA*,
LITOPELTIS, AND *CARIACASIA*.
(BLABERIDAE: EPILAMPRIINAE).

BY LOUIS M. ROTH
Pioneering Research Laboratory
U. S. Army Natick Laboratories
Natick, Massachusetts 01760

The male genitalia of cockroaches have proved to be extremely useful in showing generic relationships (Roth, 1970a, 1970b). This study of 8 genera again shows the importance of using internal male genital structures in grouping genera of Blattaria.

The genitalia of species of the following genera are illustrated in this paper: *Galiblatta* Hebard, *Dryadoblatta* Rehn, *Poroblatta* Hebard, *Nauclydas* Rehn, *Notolampira* Saussure, *Colapteroblatta* Hebard, *Litopeltis* Hebard, and *Cariacasia* Rehn. Princis (1960) placed *Dryadoblatta* and *Notolampira* in the Epilampridae (Epilamprinae and Phoraspininae respectively) and the other 6 genera in the Blaberidae, subfamily Laxtinae. McKittrick (1964) placed *Laxta* in the Epilamprinae and Princis (*in* Roth, 1970a) considered his subfamily Laxtinae provisional and predicted it probably would be split up. McKittrick (1964) placed *Litopeltis*, *Poroblatta* (with a query), and *Galiblatta* (*in* Roth, 1968) in the Epilamprinae. I follow McKittrick in placing all ovoviviparous cockroaches in Blaberidae and consider all the above genera as belonging to the Epilamprinae. Other genera of Epilamprinae will be treated in future publications.

MATERIALS AND METHODS

The source of each of the museum specimens illustrated is given using the following abbreviations: (ANSP) = Academy of Natural Sciences, Philadelphia; (BMNH) = British Museum (Natural History), London; (L) = Zoological Institute, Lund, Sweden; (MCZ) = Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; (USNM) = United States National Museum, Washington, D.C. Geographical collection data and the names of specialists who identified the specimens, if known, follow these abbreviations. The number preceding the abbreviations refers to the number assigned the specimen and its corresponding genitalia (on a slide) which are deposited in their respective museums.

RESULTS AND DISCUSSION

McKittrick (1964, p. 37) stated that "the slight differences evident in the character systems barely justify the designation of

tribes . . ." within the Epilamprinae. However, she tentatively divided the 13 genera of Epilamprinae which she studied into 5 tribes. She included *Epilampra*, *Litopeltis*, and *Poroblatta* (with a query) in the Epilamprini.

I have found that the male genitalia of many genera of Epilamprinae may be used to make tribal designations. In the present study the male genitalia clearly fall into 3 groups based on distinct differences in the L2d and prepuce.

1. Poroblattini (*Poroblatta* [Fig. 1], *Colapteroblatta* [Fig. 2], *Dryadoblatta* [Fig. 3], *Galiblatta* [Fig. 4], *Nauclydas* [Fig. 5]). — In this tribe the L2d is elongated, curved, sclerotized, tapers slightly toward the tip, and is separated from L2vm (Figs. 9, 12, 15, 18, 21, 24). Apparently there is no distinctive prepuce. The R2 has a subapical incision (Figs. 10, 13, 16, 19, 22, 25) and the shapes of L1 are all basically similar (Figs. 11, 14, 17, 20, 26). Hebard (1919) claimed that *Poroblatta* (Figs. 9-11) is related to *Colapteroblatta* (Figs. 12-14) but showed closer affinity to *Acroporoblatta*, and the nearest relative of *Colapteroblatta* was *Poroblatta*. I have not seen any males of *Acroporoblatta*, but the genitalia support Hebard's conclusion regarding a close relationship between *Poroblatta* and *Colapteroblatta*. According to Hebard (1926, p. 236) *Galiblatta* is apparently nearest *Colapteroblatta*. The close relationship between these 2 genera is seen in their genitalia but I would place *Galiblatta* closer to *Dryadoblatta* (cf. Figs. 21-23 and Figs. 24-26) than to *Colapteroblatta* (Figs. 12-14). The male genitalia of *Galiblatta cribrosa* differs from *G. williamsi* in the shape and microscopic surface of the tip of L2d (Figs. 18, 21, in Roth, 1968).

Rehn and Hebard (1927, p. 319) not having access to males tentatively assigned the West Indian species *Parasphaeria nigra* Brunner to the genus *Poroblatta*. Later Rehn (1930, p. 58) erected the genus *Nauclydas* using *P. nigra* as the type genus; he stated that *Nauclydas* ". . . belongs to the assemblage which also comprises *Colapteroblatta*, *Poroblatta*, *Acroporoblatta*, and *Galiblatta*." Rehn placed *Nauclydas* nearer *Galiblatta* than to any of the other genera. The male genitalia of *Nauclydas* (Figs. 15-17) confirm this close relationship to members of the Poroblattini.

Rehn (1930, p. 56-58) based the genus *Dryadoblatta* on *Homalopteryx scotti* Shelford. He believed that *Dryadoblatta* was ". . . probably as near to *Pinaconota* Saussure as to any other genus known at this writing . . . In the present incomplete state of our knowledge of the diagnostic features of the genera placed in the Epilamprinae, and in the absence of any phylogenetic concept of their classification, it seems best to compare *Dryadoblatta* with *Pinaconota*. Future

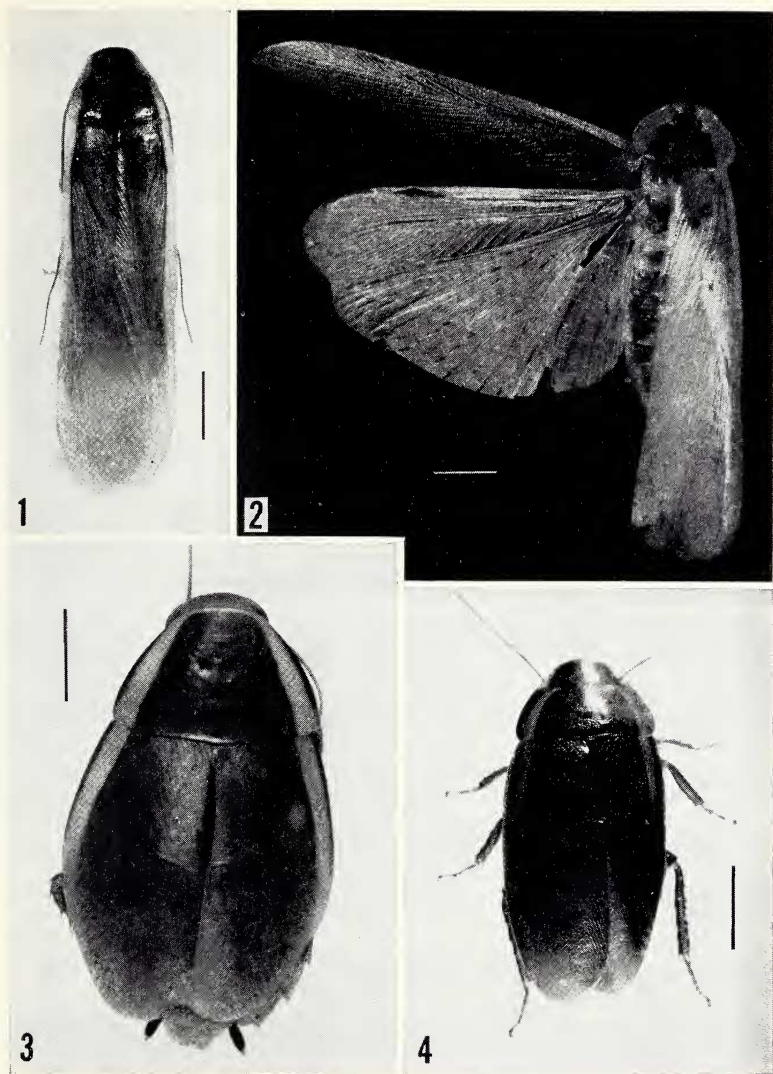
study may show the two genera are not closely related, but it is not possible at this writing to attempt an analytic treatment of the genera of the subfamily. It is certain, however, that *Dryadoblatta* is not closer in relationship to any of the other genera, and its agreement with *Pinaconota* in many features is marked."

I have examined a male specimen which Rehn determined as *Pinaconota* sp. (Fig. 52), and have also seen the male type of *Ischnoptera* (?) *sicca* Walker which Kirby synonymized with *Pinaconota bifasciata* (Saussure) and which Princis (1958, p. 68) lists as a synonym of this species. The male shown in Fig. 51 is similar to the type of *sicca*, and I collected all stages of this species in the hanging nest of an oriole in the Amazon. Princis (personal communication) examined my specimens of *sicca* and concluded that *Ischnoptera sicca* Walker is not a *Pinaconota*. The male genitalia indicate clearly that neither *Ischnoptera sicca* (Figs. 53-55) nor Rehn's *Pinaconota* sp. (Figs. 56-58) are closely related to *Dryadoblatta* (Figs. 24-26), a genus obviously related to *Galiblattea* (Figs. 21-23). The genitalia of *Pinaconota* sp. and "*I.*" *sicca* are quite different and support Princis's conclusion that they are not congeneric.

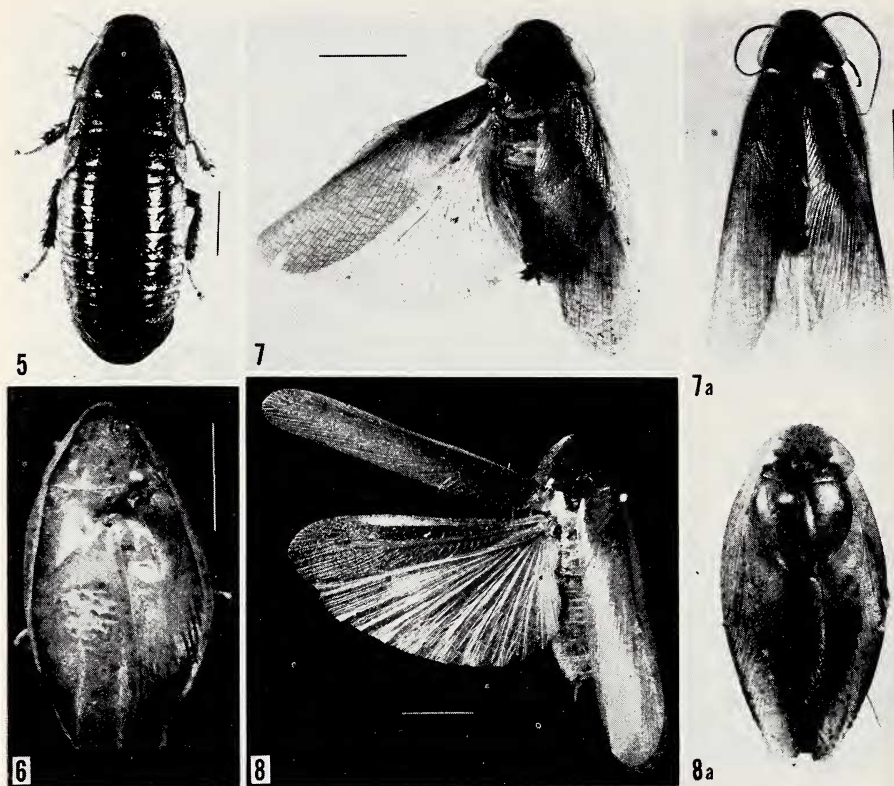
2. Notolamprini (*Notolampra* [Figs. 6, 8a]).—Rehn and Hebard (1927, p. 202) noted that the 3 species of *Notolampra* have a markedly convex dorsal surface but are more elongate than *Phoraspis*, which is a genus whose species are also strongly convex and resemble cassidid Chrysomelidae. According to Rehn and Hebard, *Notolampra* ". . . marks a transition from the more normal epilamprine type to that of the specialized phoraspid offshoot of the family." Princis (1960) placed *Notolampra* in the Phoraspinae; but the male genitalia of *Phoraspis* differ considerably from those of *Notolampra* and I have placed *Phoraspis* in the Phoraspini of the Epilamprinae (Roth, 1972).

The genitalia of 2 species of *Notolampra* which I have seen differ markedly from each other. In *N. gibba* (Type genus) the L2d (Fig. 27) is much more robust than the L2d of members of Poroblattini, and does not taper toward the apex. R1 (Fig. 28) is long and slender and has a subapical incision; L1 (Fig. 29) differs in shape from the L1 of Poroblattini (cf. Figs. 11, 14, 16, 20, 23, 26). In *N. antillarum*, the shape of L2d (Figs. 30, 33) differs from that of *N. gibba* (Fig. 27) and is partially covered by minute spines. The phallomeres R1 (Figs. 31, 34) and L1 (Figs. 32, 35) are very similar to those of Poroblattini. *Notolampra gibba* is found in Brazil, and *N. antillarum* is West Indian.

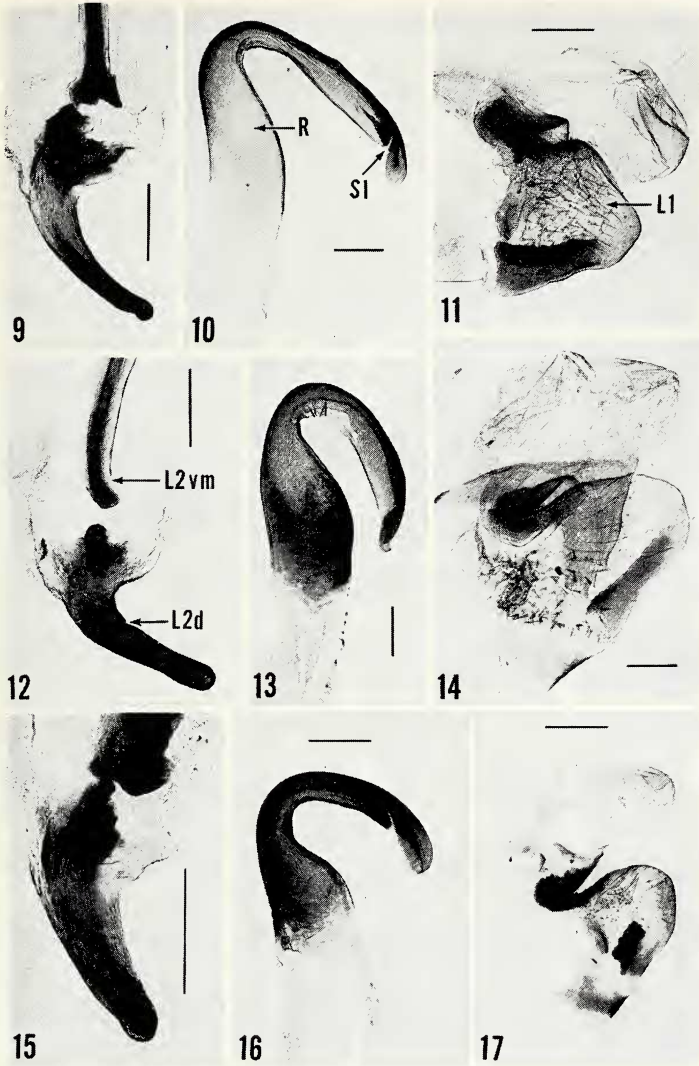
3. Epilamprini (*Litopeltis* [Figs. 7, 7a], *Cariacasia* [Fig. 8]).—The genitalia of *Litopeltis* and *Cariacasia* are sufficiently close to



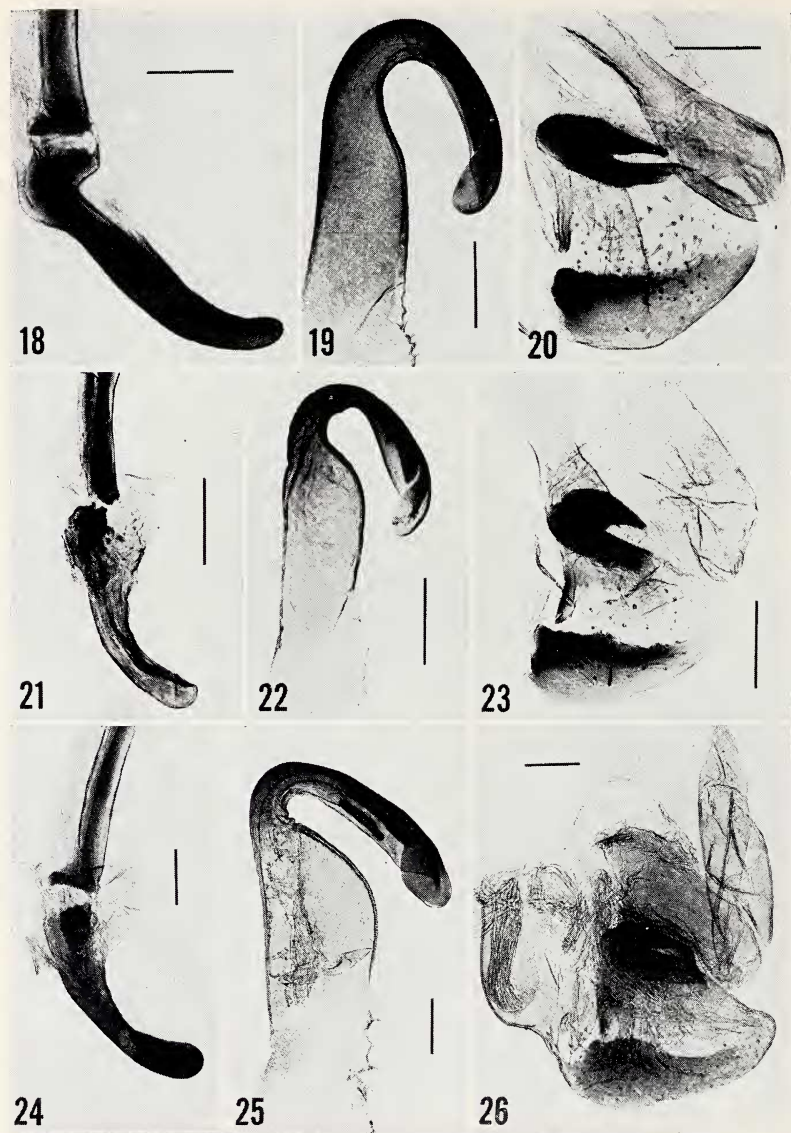
Figs. 1-4. Adult males of Epilamprinae (Poroblattini). 1. (118 ANSP). *Poroblatta* sp. Sierra San Lorenzo, Magdalene, Colombia. 2. (116 ANSP). *Colapteroblatta compsa* Hebard. Type. San Lorenzo, Santa Marta, Colombia. 3. (17 MCZ). *Dryadoblatta scotti* (Shelford). Mount Tucuche, Trinidad (type locality) (det. Darlington). 4. (USNM). *Galiblatia williamsi* Roth. Taruma-Acu, about 15 Km. northeast of Manaus, Amazonas, Brazil (from Roth, 1968). (scale = 5 mm).



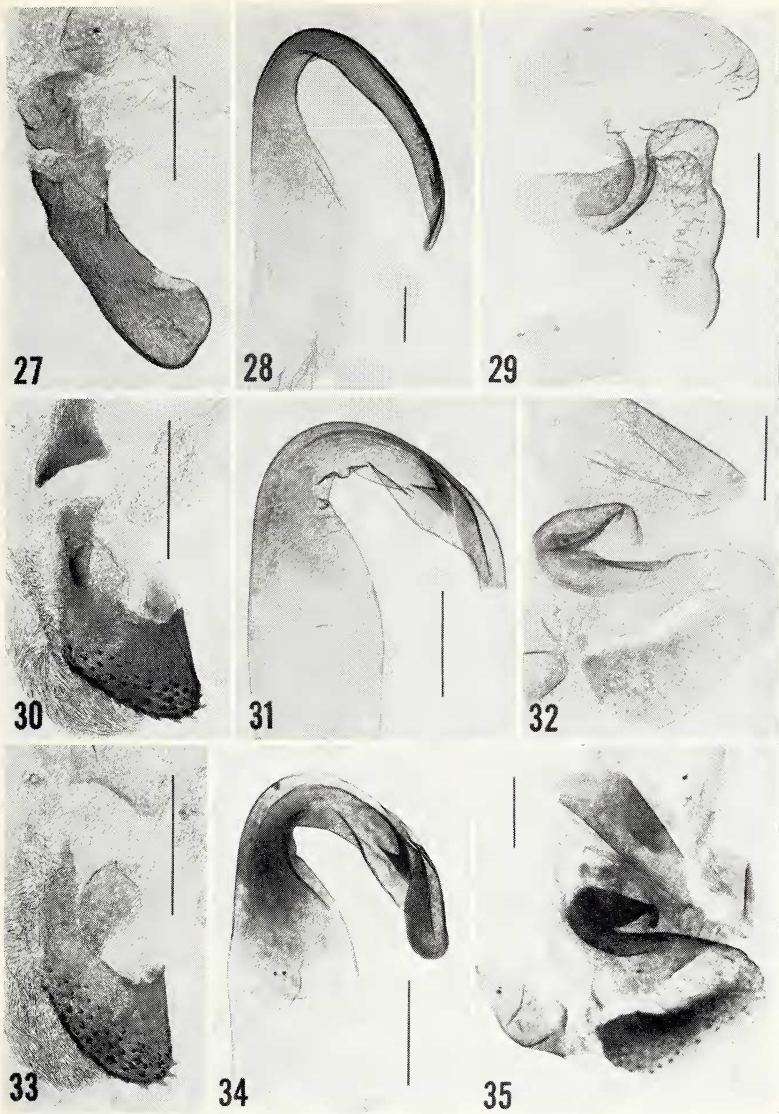
Figs. 5-8a. Adults of Epilamprinae. 5. Poroblattini. *Naulidas nigra* (Brunner). (♀; adventive obtained from the British museum). 6. (1469L). Notolamprini. *Notolampra antillarum* Shelford. Trinidad (det. Princis). 7. (119 ANSP). *Litopeltis oreas* Rehn. Paratype. Santa Maria de Dota Costa Rica. 7a. (172 ANSP). *Litopeltis biolleyi* (Saussure). Costa Rica (det. Rehn). 8. (114 ANSP). *Cariacasia capucina* Rehn. Type 1123. Carilla, Costa Rica. 8a. (175 ANSP). *Notolampra gibba* (Thunberg). Pernambuco, Brazil (det. by Hebard as *Notolampra cassidea* (Burm.), a synonym).



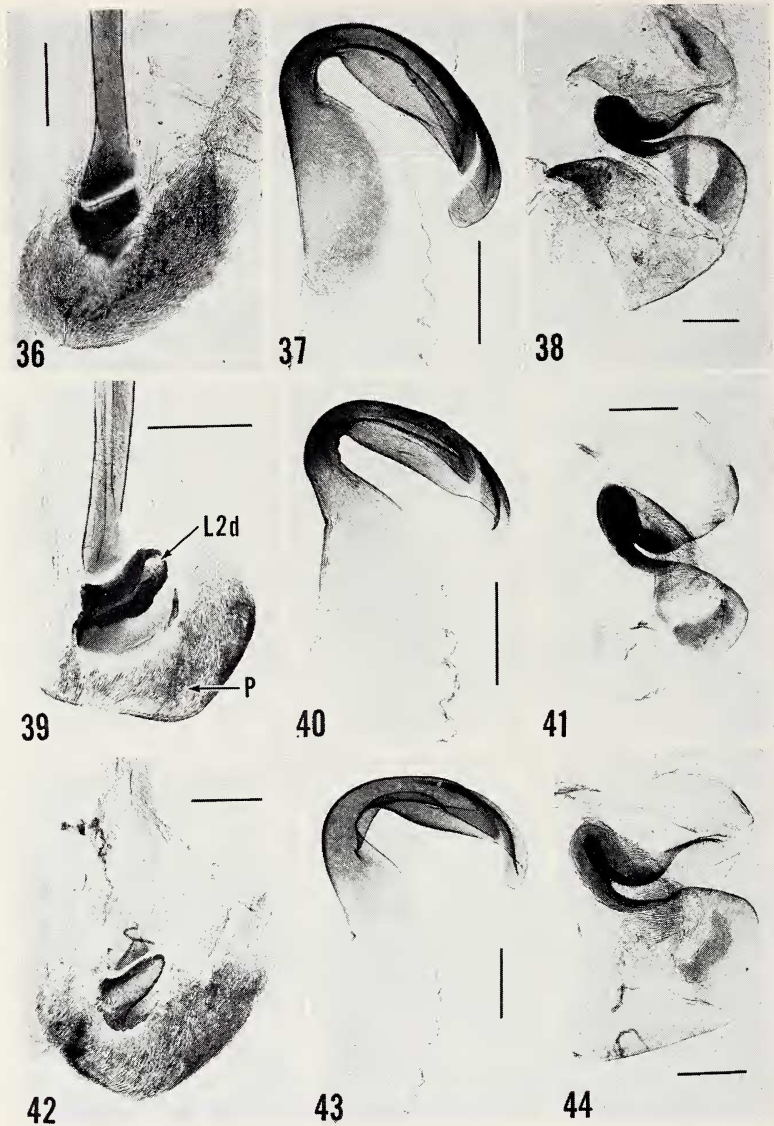
Figs. 9-17. Cockroach male genitalia of Epilamprinae (Poroblattini). 9-11. (118 ANSP). *Poroblatta* sp. (from specimen shown in Fig. 1). 12-14. (116 ANSP). *Colapteroblatta compsa* (from specimen shown in Fig. 2). 15-17. *Nauclydas nigra*. (from adventive on bananas probably originating in the West Indies; specimen from a small culture established at the British Museum). (L1 = first sclerite of left phallosome; L2vm = median sclerite; L2d = dorsal sclerite of L2; R2 = hooked sclerite of right phallosome; SI = subapical incision). (scale = 0.3 mm).



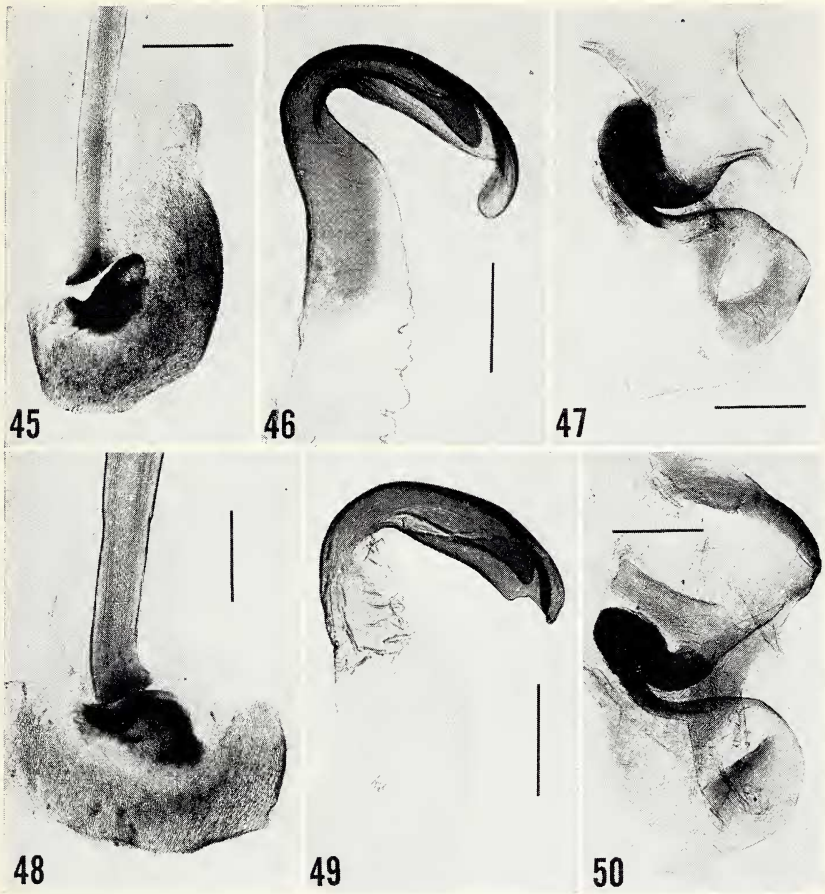
Figs. 18-26. Cockroach male genitalia of Epilamprinae (Poroblattini). 18-20. (ANSP). *Galiblatla cribrata* Hebard. Type No. 1029. St. Jean du Maroni, French Guiana. 21-23. (USNM). *Galiblatla williamsi*. Taruma-Acu, about 15 Km. northeast of Manaus, Amazonas, Brazil (det. Roth). 24-26. (17 MCZ). *Dryadoblatta scotti*. (from specimen shown in Fig. 3). (Figs. 18-23 from Roth, 1968). (scale = 0.3 mm).



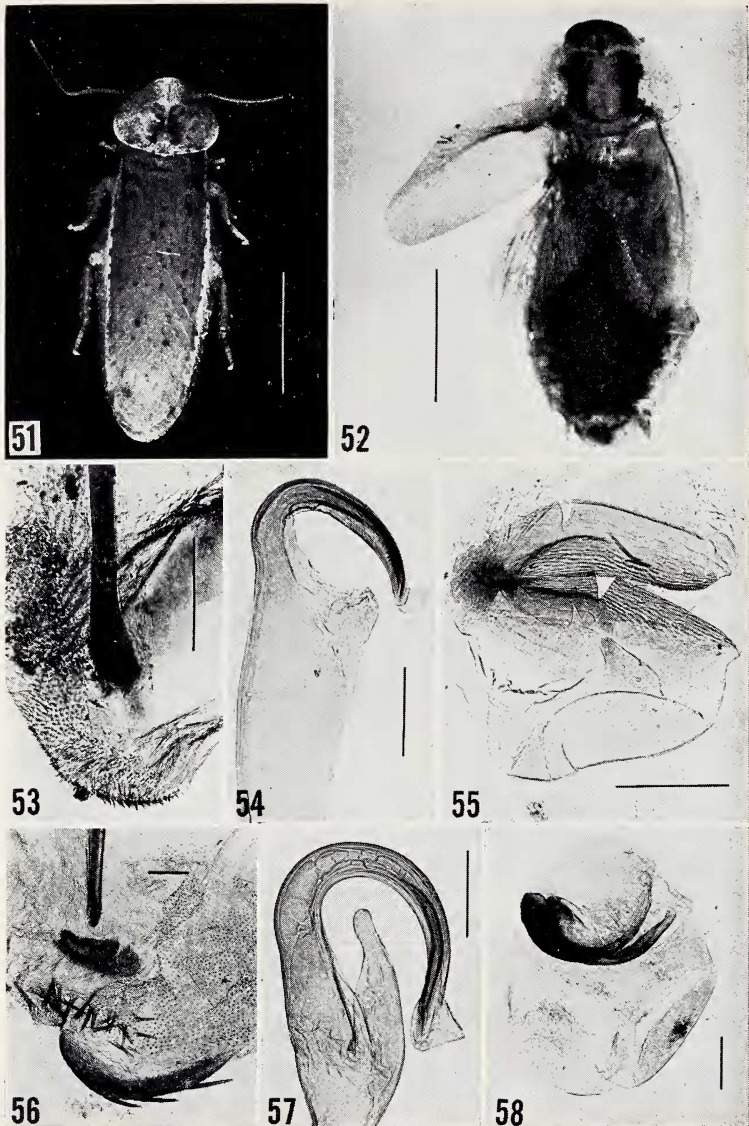
Figs. 27-35. Cockroach male genitalia of Epilamprinae (Notolamprini). 27-29. (175 ANSP). *Notolampra gibba* (from specimen shown in Fig. 8a). 30-35. *Notolampra antillarum*. 30-32. (24 BMNH). Trinidad. 33-35. (1469 L). (from specimen shown in Fig. 6). (det. Princis). (scale = 0.3 mm).



Figs. 36-44. Cockroach male genitalia of Epilamprinae (Epilamprini). 36-38. *Litopeltis bispinosa* (Saussure). Puntarenas Province, Costa Rica (det. Fisk). 39-41. (168 ANSP). *L. bispinosa*. Porto Bello, Panama (det. Rehn). 42-44. (172 ANSP). *Litopeltis biolleyi*. (from specimen shown in Fig. 7a). (L2d = dorsal sclerite of L2; P = prepuce). (scale = 0.3 mm).



Figs. 45-50. Cockroach male genitalia of Epilamprinae (Epilamprini). 45-47. (119 ANSP). *Litopeltis oreas*. Paratype. (from specimen shown in Fig. 7). 48-50. (114 ANSP). *Cariacasia capucina*. Type. (from specimen shown in Fig. 8). (scale = 0.3 mm).



Figs. 51-58. Adult males and male genitalia of Blaberidae. 51. "*Ischnoptera*" *sicca* Walker. Near Serra Tamendaui, Rio Negro, Amazonas (det. Roth). 52. (189 USNM). *Pinaconota* sp. Ilha das Alcatrazes, São Paulo, Brazil. (det. Rehn). 53-55. "*Ischnoptera*" *sicca* (same data as specimen shown in Fig. 51). 56-58. (189 USNM). *Pinaconota* sp. (from specimen shown in Fig. 51). (scale for adults = 5 mm., for genitalia = 0.2 mm).

most *Epilampra* (Roth, 1971) to place them in Epilamprini; L2d is a variably shaped dark sclerite separated from L2vm and the prepuce is usually a distinctively shaped lobe covered by microtrichia (Fig. 39). The R1's of *Litopeltis* (Figs. 37, 40, 43, 46), and *Cariacasia* (Fig. 49) have a subapical incision and the shapes of L1 (Figs. 38, 41, 44, 47, 50) are similar. The differences in the genitalia of the 3 species of *Litopeltis* are so minor (Figs. 36-47) that it would be impossible to use them to distinguish species.

When Hebard (1920, p. 140) described the genus *Litopeltis* he stated that it ". . . belongs to the second section of the Perisphaerinae, containing *Stenopilma* Sauss. [= *Cyrtotria*] and its allies. To this section also belong the American genera *Colapteroblatta*, *Poroblatta* and *Acroporoblatta* Hebard and *Mioblatta* . . . nearest relationship with *Colapteroblatta* exists, this indicated by the general similarity of tegminal and wing form and venation and limb armament." The genitalia of *Litopeltis* (Figs. 36-47) are sufficiently different from those of *Colapteroblatta* (Figs. 12-14) to place them in different tribes.

Rehn (1928, p. 190) in discussing the genus *Cariacasia* placed it in the Perisphaeriinae and claimed it was related to *Litopeltis* and *Mioblatta* Saussure. However, he also stated that ". . . the male of *Litopeltis* superficially looks more like the epilamproid genus *Leurolestes* [= *Phoetalia*]. The relationship of the two genera here treated is, however, more intimate than a casual glance, even at individuals of the same sex, would indicate." *Phoetalia* has male genitalia characteristic of Blaberinae and I recently assigned it to this subfamily (Roth, 1970b). Because of differences in tarsal armament, Rehn (1930, p. 59) removed *Litopeltis* and *Cariacasia* ". . . from the vicinity of the *Poroblatta* complex, although their general appearance much suggests the latter assemblage." The genitalia of *Litopeltis* (Figs. 36-47) and *Cariacasia* (Figs. 48-50) are very similar showing a close relationship, and differ from those of Poroblattini, thus supporting Rehn's conclusions.

SUMMARY

Based on male genitalia, 8 genera of Epilamprinae are placed into 3 tribes as follows:

1. Poroblattini. — *Poroblatta*, *Naucldas*, *Galiblatta*, *Dryadoblatta*, and *Colapteroblatta*.
2. Notolamprini. — *Notolampra*.
3. Epilamprini. — *Litopeltis*, *Cariacasia*.

ACKNOWLEDGMENTS

I thank Dr. N. Jago, Academy of Natural Sciences, Philadelphia, Dr. Ashley Gurney, U. S. National Museum, Washington, D.C., Dr. David Ragge, British Museum (Natural History), London, Dr. Frank Fisk, Ohio State University, Columbus, and Dr. Karl Princis, Lund, Sweden, for the loan of specimens. I collected specimens of "*Ischnoptera*" *sicca* during Phase C of the Alpha Helix expedition to the Amazon in 1967. I thank the National Science Foundation for support on the Amazon expedition under Grant NSF-GB-5916. I am grateful to Mr. Samuel Cohen for taking the photographs.

REFERENCES

- HEBARD, M.
 1919. Studies in the Dermaptera and Orthoptera of Colombia. First paper. Trans. Amer. Entomol. Soc. 45: 89-179.
 1920. The Blattidae of Panama. Mem. Amer. Entomol. Soc. 4: 1-148. (1919).
 1926. The Blattidae of French Guiana. Proc. Acad. Nat. Sci. Phil. 78: 135-244.
- McKITTRICK, F. A.
 1964. Evolutionary studies of cockroaches. Cornell Univ. Agric. Exp. Sta. Memoir 389, 197 pp.
- PRINCIS, K.
 1958. Revision der Walkerschen und Kirbyschen Blattarientypen im British Museum of Natural History, London. II. Opus. Entomol. 23: 59-75.
 1960. Zur systematik der Blattarien. Eos 36: 427-449.
- REHN, J. A. G.
 1928. New or little known Neotropical Blattidae (Orthoptera). Number one. Trans. Amer. Entomol. Soc. 54: 125-194.
 1930. New or little known Neotropical Blattidae (Orthoptera). Number two. Trans. Amer. Entomol. Soc. 56: 19-71.
- REHN, J. A. G. AND M. HEBARD
 1927. The Orthoptera of the West Indies. Number 1. Blattidae. Bull. Amer. Mus. Nat. Hist. 54: 1-320.
- ROTH, L. M.
 1968. A new species of *Galiblatia* from Brazil (Blattaria, Blaberidae). Psyche 75: 249-255.
 1970a. The male genitalia of Blattaria. III. Blaberidae: Zetoborinae. Psyche 77: 217-236.
 1970b. The male genitalia of Blattaria. IV. Blaberidae: Blaberinae. Psyche 77: 308-342.
 1971. The male genitalia of Blattaria. V. *Epilampra* spp. (Blaberidae: Epilamprinae). Psyche 77: 436-486.
 1972. The male genitalia of Blattaria. IX. Blaberidae. *Gyna* spp. (Perisphaeriinae), *Phoraspis*, *Thorax*, and *Phlebonotus* (Epilamprinae). Trans. Amer. Entomol. Soc. (in press).